



Let the sun shine in: Effects of ultraviolet radiation on invasive pneumococcal disease risk in Philadelphia, Pennsylvania

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Abstract:

BACKGROUND: *Streptococcus pneumoniae* is a common cause of community acquired pneumonia and bacteremia. Excess wintertime mortality related to pneumonia has been noted for over a century, but the seasonality of invasive pneumococcal disease (IPD) has been described relatively recently and is poorly understood. Improved understanding of environmental influence on disease seasonality has taken on new urgency due to global climate change. **METHODS:** We evaluated 602 cases of IPD reported in Philadelphia County, Pennsylvania, from 2002 to 2007. Poisson regression models incorporating seasonal smoothers were used to identify associations between weekly weather patterns and case counts. Associations between acute (day-to-day) environmental fluctuations and IPD occurrence were evaluated using a case-crossover approach. Effect modification across age and sex strata was explored, and meta-regression models were created using stratum-specific estimates for effect. **RESULTS:** IPD incidence was greatest in the wintertime, and spectral decomposition revealed a peak at 51.0 weeks, consistent with annual periodicity. After adjustment for seasonality, yearly increases in reporting, and temperature, weekly incidence was found to be associated with clear-sky UV index (IRR per unit increase in index: 0.70 [95% CI 0.54-0.91]). The effect of UV index was highest among young strata and decreased with age. At shorter time scales, only an association with increases in ambient sulphur oxides was linked to disease risk (OR for highest tertile of exposure 0.75, 95% CI 0.60 to 0.93). **CONCLUSION:** We confirmed the wintertime predominance of IPD in a major urban center. The major predictor of IPD in Philadelphia is extended periods of low UV radiation, which may explain observed wintertime seasonality. The mechanism of action of diminished light exposure on disease occurrence may be due to direct effects on pathogen survival or host immune function via altered 1,25-(OH)₂-vitamin-D metabolism. These findings may suggest less diminution in future IPD risk with climate change than would be expected if wintertime seasonality was driven by temperature.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2797517>

Resource Description

Exposure : ☒

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors, Meteorological Factors, Meteorological Factors, Solar Radiation, Temperature

Air Pollution: Particulate Matter, Other Air Pollution

Climate Change and Human Health Literature Portal

Air Pollution (other): SO_x; NO_x; CO

Geographic Feature: 

resource focuses on specific type of geography

Urban

Geographic Location: 

resource focuses on specific location

United States

Health Impact: 

specification of health effect or disease related to climate change exposure

Respiratory Effect

Respiratory Effect: Bronchitis/Pneumonia

Population of Concern: A focus of content

Population of Concern: 

populations at particular risk or vulnerability to climate change impacts

Children, Elderly

Resource Type: 

format or standard characteristic of resource

Research Article

Timescale: 

time period studied

Time Scale Unspecified